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Access to dental services for children: a scoping review on the impact of COVID-19 and implications for future models of care

Sally Hall Dykgraaf ,[1] Anthony Paulo Sunjaya ,[2,3] Daniel James,[4] Michael Kidd[5,6]

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For numbered affiliations see end of article.

Correspondence to
Dr Anthony Paulo Sunjaya; a.sunjaya@unsw.edu.au and Dr Sally Hall Dykgraaf; sally.hall@anu.edu.au

ABSTRACT

Background The COVID-19 pandemic had detrimental effects on routine health and social care as countries instituted widespread public health measures to control transmission of SARS-CoV-2. This affected care delivery for many chronic and non-communicable diseases, including oral health and dental diseases with implications in the postpandemic period.

Objectives This scoping review, conducted in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses for Scoping Review guidelines, aims to synthesise evidence regarding the impact of COVID-19 on access to dental services among children and their implications for future models of care, especially for children from low-income families, to inform policy decision making around subsidised dental services in Australia.

Data sources PubMed, Web of Science, Embase, Cochrane Library of Systematic Reviews and Cochrane Central Register of Controlled Trials.

Eligibility criteria Primary studies of any design published between 1 January 2020 and 31 July 2024. Included studies described provision of paediatric dental services, considered components of access or utilisation and were published in English. Excluded studies were those that only evaluated maxillofacial services.

Data extraction and synthesis Data were extracted using a standardised template in MS Excel then analysed to thematically classify findings based on key areas of impact. Quality assessment of studies was not conducted.

Results 54 articles from 17 countries were included. Studies identified reductions in service availability and utilisation, including patient and parent-driven demand. Changes to the configuration of services included greater rates of emergency treatment, reductions in use of aerosol-generating procedures and more use of teledentistry, as well as self-management and prevention approaches. Substantial delays to routine dental care, leading to more dental problems and ongoing need, especially untreated dental caries, were observed with a disproportionate impact on socioeconomically disadvantaged and vulnerable children and families.

Conclusion The COVID-19 pandemic has had pronounced negative effects on the provision of primary and secondary dental care for children around the world. Access to care was affected by disruptions to service availability and by changes in demand for services related to parental anxiety around the risk of COVID-19 transmission. Delays in receipt of routine dental care and changes to oral health behaviours are likely to lead to an increased need for oral health services, with service adaptations needed to ensure this increased demand can be met.

INTRODUCTION

Poor oral health has been estimated to affect up to half the world's population yet remains a neglected global health issue.[1] The economic impact has been estimated at over 5% of global health expenditure.[2] Oral health is an important contributor to overall health and well-being; it is increasingly recognised as a key public health priority that aligns with the United Nations Sustainable Development Goals and their focus on universal health coverage to achieve 'health for all'.[3] Similar to other non-communicable diseases, dental diseases are largely chronic and are strongly socially patterned, with a disproportionate impact on socioeconomically disadvantaged and marginalised members of the community.[3 4] They remain prevalent despite being treatable and preventable. Services can be inequitably distributed and difficult to access.[4] Many oral health problems stay untreated because of cost, especially in low-resource settings,[4] with profound health-related and economic burdens and substantial impact on quality of life.[5]

The COVID-19 pandemic had been a time of great uncertainty for dental health professionals, especially in the earliest years of the pandemic. Dentists had been caught between the needs of caring for patients, providing effective infection control for an (initially) unknown agent, adhering to recommendations, protecting their staff and themselves and managing the financial imperatives of running and sustaining businesses during

lockdowns and other public health measures.[6] Changes in dental service utilisation and patient preferences have been observed, with delays in care and potential reductions in oral health status.[7] Adaptations and innovations were needed to maintain service provision and ensure the safety of dental health professionals and patients,[8] including the adoption of robust infection prevention and control (IPC) protocols and novel approaches such as teledentistry.

Three previous systematic reviews had explored the use of teledentistry in paediatric settings,[9] provision of oral health advice to children and parents[10] and changes to paediatric dental practices during the pandemic.[11] However, we found no existing reviews synthesising evidence regarding the impact of COVID-19 on access to paediatric dental services, despite a number of primary studies.

This paper describes the findings of a scoping review, conducted to inform the work of the Australian Department of Health and Aged Care in support of a report,[12] which was published in 2023.[12] This review aimed to synthesise evidence from the international literature examining the impact of COVID-19 on access to dental services among children and discuss their implications for future models of care to ensure timely and equitable access to dental services, especially to children from lower socioeconomic backgrounds.

METHODS

Search strategy and selection criteria

The study was undertaken as a scoping review and reported in line with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) extension for Scoping Reviews.[13] A rapid review was conducted to synthesise evidence up to 6 June 2022 as there was an urgent need for policy makers to access the synthesis on which to base decisions. Thereafter, this was further updated and refined to include new studies up to 31 July 2024 for this publication.[14–16]

We systematically searched the academic literature using PubMed, Web of Science, Embase, Cochrane Database of Systematic Reviews and Cochrane Central Register of Controlled Trials for primary studies published between 1 January 2020 and 31 July 2024. Reference lists of relevant studies and reviews published during the study period were also hand searched to identify relevant primary studies for inclusion.

The search strategy used a combination of terms relating to dentistry and oral healthcare (eg, “dental care” or “dental treatment”); COVID-19 (eg, “coronavirus” or “SARS-CoV-2”); access and utilisation (eg, “impact” or “access”) as detailed in the online supplementary material.

Inclusion and exclusion criteria

Primary studies of any design were included if: (1) they specifically considered children as a population of interest; (2) they included outcomes relating to access to services in terms of either supply-side factors, such as service provision or availability, or demand-side factors, such as utilisation, need or demand[17] and (3) they were published in peer-reviewed English-language journals.

Studies were excluded if they dealt only with cleft palate and maxillofacial services, in the absence of general oral healthcare or were purely editorial/opinion pieces without any primary data.

Data analysis

Title and abstract screening, full text review and data extraction were conducted independently by one of two reviewers (SHD or APS). The study selection process is outlined in figure 1. Narrative summary data were extracted using a standardised extraction template that included year of publication, country of origin, study design, setting, sample or population and relevant findings. Identification of duplicate records, screening, data extraction and analysis were all managed electronically using EndNote (Clarivate, 2013) and MS Excel (Microsoft Corporation, 2018). Quality assessment of individual studies was not conducted. Data were analysed inductively using narrative synthesis.

RESULTS

Searches retrieved 1255 records after the removal of duplicates. Following the screening of 54 studies, all studies using observational designs and published between 2020 and 2024 were included in the review. Included papers comprised one qualitative study of dental providers;[18] two prospective service evaluations;[19 20] 11 cohort studies often with prepandemic and postpandemic comparisons;[21–31] one case control study with a prepandemic control group;[32] 12 analyses of electronic dental records or other routinely collected data;[33–44] 22 cross-sectional surveys,[45–66] including four studies leveraging a nationally representative population survey (National Survey of Children’s Health) in the USA;[61–64] two descriptive reports using individual service data;[67 68] one pilot controlled study of a new model of care;[69] two modelling studies.[70 71]

Multiple articles were from the USA (n=12),[29 31 44 45 51 61–65 68 71] Brazil (n=6),[21 23 33 38 46 47] India (n=6),[22 24 25 27 41 50] Turkey (n=4),[28 52 56 58] the UK (n=4),[18–20 69] China (n=4),[39 40 44 53] Italy (n=4)[30 43 48 60] and Saudi Arabia (n=4),[36 59 66 67] and one each from Australia,[35] Bosnia and Herzegovina,[42] Cyprus,[49] Germany,[55] Israel,[37] Peru,[34] Poland[32] and Romania.[26] Two studies were international, focusing on Europe.[54 57] Included papers are summarised in figure 1 and online supplemental table S1.

Seven key themes are found by our scoping review (table 1) with further details found below.

Reduced dental service utilisation

Children and young people were often denied access to routine dental care, as COVID-19 outbreaks forced the suspension of dental treatment, especially routine,

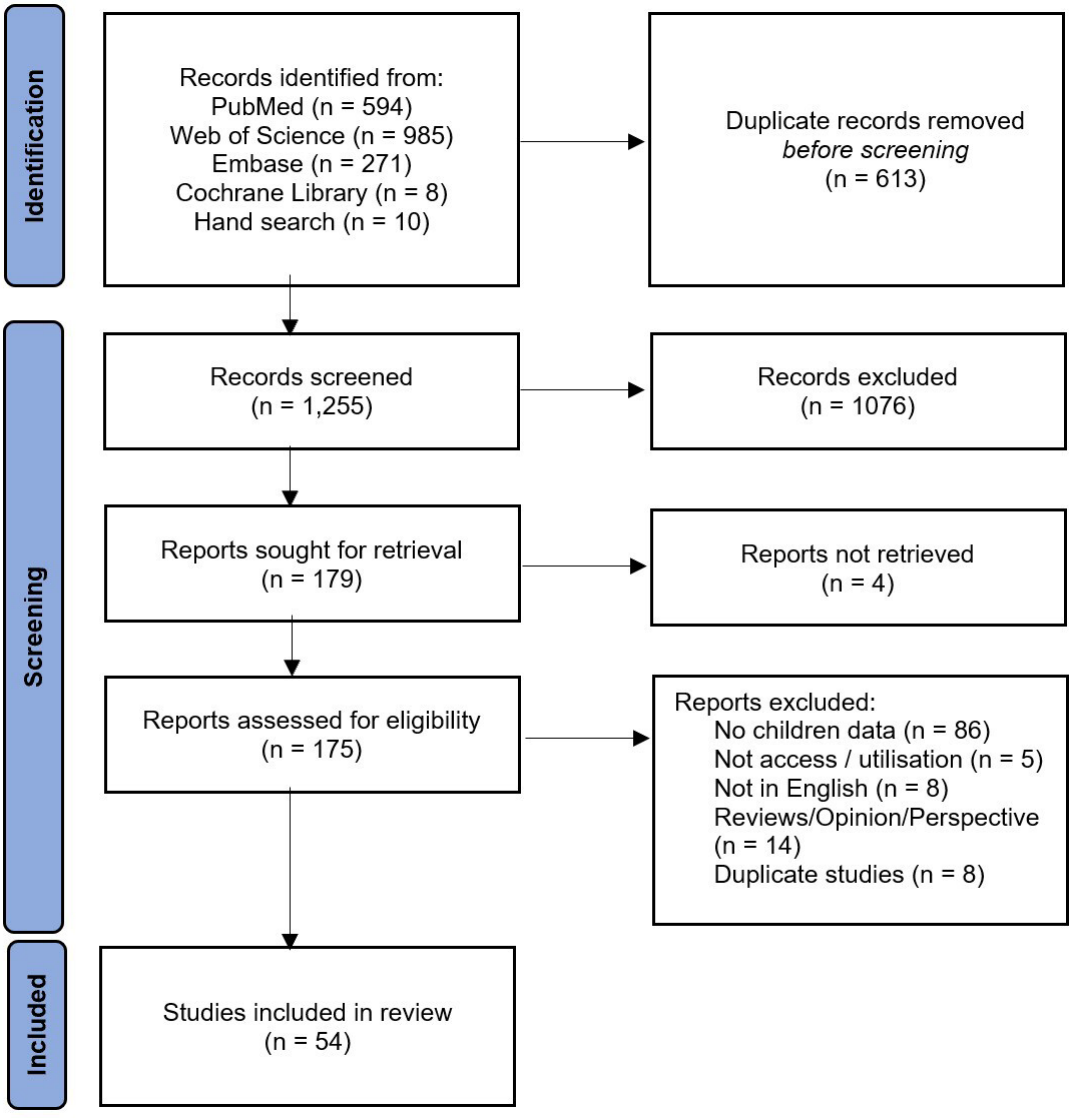

Figure 1 Study screening and selection.

elective or preventive services, in many countries. This occurred both as a result of specific policy directives stopping or deferring non-urgent dental care[37] and in response to generalised lockdown conditions, social restrictions or other public health measures. Access to oral health services for children was also compounded by constraints on the provision of many community and preventive health services with a role in promoting oral health.[22 25 41 51 54 55]

Two international surveys of dental professionals found that while the proportion providing paediatric dentistry fell from 55.7% to 45.6% during lockdown periods, this subsequently recovered (54.1%, p =0.004)[54] and fewer paediatric dentists than other dental specialists stopped all clinical activities; 64.6% limited clinical activity to emergency dental care only, while 18.3% continued to provide routine dental treatment. However, paediatric dentists also reported higher rates of COVID-19-related symptoms and positive tests than other dental specialists.[57]

Reductions in paediatric dental demand, patient flow and service utilisation were observed in many studies, as a result of dental practices being closed or offering restricted services or caregiver's perception of increased risk compared with other activities.[25 29 33 35 36 38 45 55 64 67] Estimates of scale varied due to differences in epidemiological context and methodology, but ranged between reductions of 39% and 93%,[25 36 38 45] with significant decreases in emergency visits, non-emergency visits and admissions.[28 30 39 40 42 43] While declines in dental service utilisation partially rebounded for adults, this was not so for children.[28] A US study comparing the decline in dental versus medical visits in the past year among children reported a similar rate of decline between the pandemic and prepandemic period across both types of visits (dental −4.4% vs medical −5.9%).[64]

Even after restrictions were lifted, dental service capacity sometimes remained limited due to the need for additional and ongoing IPC measures.[27] Specific risks and

Table 1 Key themes identified in the scoping review

Theme	Sub-Themes	References
Reduced dental service utilisation	Significant decreases in all dental presentations—emergency, non-emergency (including preventive) and admissions.	28 30 39 40 42 43
	The fall in utilisation has not been reversed even after 2 years since the pandemic started.	30 42
Changes to service profiles	More minimally invasive and less aerosol-generating procedures.	35
	Antibiotics and self-management.	19
	When present in person, more extractions rather than restorative procedures.	29 37
	Higher cost of dental care compared with prepandemic period.	44
Impact of delayed dental care	Longer waiting lists and longer time to see a clinician.	18 34 37
	Increase in severity of presentations, even in those with optimal prepandemic care.	31 51
'Demand-side' influences on access to dental services	Worse oral health risk behaviour such as an increase in consumption of sugary drinks and a decrease in oral hygiene with potential differences across socioeconomic lines.	50 51
	Shift in perception of the need for dental care which may persist in the post-pandemic period.	21
Parental anxiety and demand for services	Cancellation of visits even when they are available due to parental anxiety.	52 55
	Self-treatment without medical supervision.	53
Inequity and vulnerability	Existing disparities persist despite new models of care and lockdown affecting the whole population.	62
	Pandemic job losses linked to worsening child dental care.	65
	Uneducated and low/middle-income families are more likely to have children with dental decay.	59
	Inequitable impacts on vulnerable populations such as those who have hearing impairment or chronic comorbidities such as cancer.	24
New models of care	Teledentistry showed capacity to be a suitable alternative to in-person visits.	20 25 49 54 57 68
	Models of care that emphasise 'dental care restraint' empowering parents to do more.	22
	Tiered models of dental care (eg, primary referrals needed for specialist paediatric dentist services) may reduce the waiting times to see a first clinician contact.	69

safety concerns included the need for close proximity to patient airways in the clinical setting and the pronounced risk of aerosol generation with some dental procedures, though an Italian study noted that only 8% of parents perceived visiting a dental practice as conferring higher risk of COVID-19 than other closed settings.[60]

Studies have also shown that following the first year of the pandemic, there was a differential return to normal capacity across various services. For example, in Bosnia, while dental treatments nearly returned to prepandemic levels in the second year of the pandemic, preventive and prophylactic treatments remained significantly lower than prepandemic levels.[42] Similarly in Italy, while there was a rebound in visits after the first lockdown, the increase in volume remained lower than the gap that had arisen due to a significant drop in visits during lockdown periods.[30]

Changes to service profiles

Several studies described changes in the nature and type of services provided during the pandemic. Along with reductions in routine and preventive care and a focus on urgent services,[25 31 55 58] these usually shifted towards more minimally invasive procedures in order to reduce the risk of aerosol generation.[35] Treatment modalities were often

adjusted in favour of medical management such as antibiotic prescription (eg, one UK study reported 80.5% of paediatric dental patients had prior antibiotic prescription on presentation to an ED[19]) and the promotion of home treatment and prevention strategies.[22 36 63] In Australia, the greatest decline was in preventive and diagnostic services, with smaller declines in endodontic services and oral surgery,[35] whereas in India, a modelling study suggested an increase in the number of temporary restorations, indirect and direct pulp capping, pulpectomies and root canal treatments as well as tooth extractions.[41] This result was supported by a US study which reported increases in tooth infections (68% vs 40%) and teeth extractions (15% vs 1%) during the pandemic compared with the prepandemic period.[29]

Several studies described increased proportions of emergency presentations (eg, 52% vs 5%), although overall numbers often remained low.[67] Some reported increased rates of dental trauma (eg, from 0.3% to 2.2%), especially in very young children,[22 25] though this was not consistent. A study in China comparing data during the week following COVID-19 identification (the end of January to the first week of February 2020) with a year earlier conversely reported an increase in the proportion of patients with acute toothaches and infections but a fall in those with oral and maxillofacial trauma.[39] Commonly treated problems were toothache or dental pain associated with caries and pulpal inflammation, infection, cellulitis, dental abscess and oral or maxillofacial trauma.[19 22 25 28 43]

While shortages of hospital resources, along with cancellation of routine secondary dental care appointments, led to significant reductions in dental care under sedation and general anaesthesia (GA) globally, an Israeli study found reductions in rates of inhaled or conscious sedation, but greater rates of GA, deep sedation and non-pharmacological behaviour management, along with higher levels of tooth extraction and pulpectomy, but relatively fewer permanent restorations.[37] Whereas, a study in Brazil among oncopaediatric patients reported an 80.2% reduction in dental procedures performed in the wards and intensive care unit during the COVID-19 period compared with the prepandemic period.[38]

Differences were also reported with regards to the cost of services delivered across the paediatric age groups. A US study of dental insurance claims data based on a random sample of 5% of visits during the pre-COVID-19, COVID-19 shutdown, early recovery and later recovery periods found that those aged 0–5 years had significantly higher claims paid per visit during the shutdown period compared with pre-COVID-19, whereas this was not found for other paediatric age groups, suggesting a greater amount of treatment required.[71]

Impact of delayed dental care

Service cancellations and postponements were observed to contribute to longer waiting lists,[18 37] with the potential for problematic delays in care leading to increased oral health need, especially for children with disabilities or other complex needs.[24 35 38] The 2020 pandemic year had a negative impact on the timing of dental care in Peruvian children, increasing the time since the last dental visit by 1.39 years compared with 2019.[34] In the USA, in 2020, the parents of children were more likely to report poor dental health, bleeding gums and lower likelihood of dental visits in the preceding 12 months than prior to the pandemic.[61] One year after the pandemic began, 15% of the US children visiting community paediatric dentists had not had treatment, and 14% had more caries than at previous visits.[51] In this US study, 11% of children experienced more frequent oral signs of stress, such as temporomandibular disorder and aphthous stomatitis, during lockdown, and younger children were diagnosed with carious lesions more often.[51] The length of pandemic lockdowns meant that significant increases in dental swelling, fistula and other conditions were reported, even in a selected group of children who had optimal preventive dental care prior to the pandemic as part of an existing school-based dental intervention programme.[31] However, evidence regarding dental markers of stress was mixed, with a Brazilian study finding characteristics associated with emotional distress such as sugar consumption, bruxism and sleep quality did not change significantly and were not associated with social distancing measures.[21]

'Demand-side' influences on access to dental services

In addition to cancelled examinations and treatments, one US study considered the impact of COVID-19 on oral healthcare needs in terms of changes to oral health risk behaviours, including consumption of sugary snacks and drinks and changes to oral hygiene and preventive practices such as toothbrushing. Changes were observed to each of these domains among some children, with a resultant shift in risk profile.[51]

Numerous studies explored self-care behaviours related to diet, oral hygiene and health, although evidence was mixed with some suggestion that these may differentiate along socioeconomic lines.[50] An Italian study found substantial changes in the dietary and eating habits of families related to lockdowns, with some change in oral hygiene habits also. Toothbrushing frequency was unchanged, but eating and drinking afterwards significantly increased.[48] Others found oral hygiene behaviours such as toothbrushing increased[53] and that consumption of fast food, packaged food and carbonated beverages reportedly decreased during COVID-19.[52] In an Indian study of parental attitudes, only 33% took extra efforts to maintain children's oral hygiene, and 45% made dietary changes, suggesting a need for increased awareness and motivation among parents around preventive practices.[50]

Two Brazilian investigations found decreased preventive behaviours and lower perceived need for dental treatment among Brazilian adolescents before and after the pandemic[21] and reduced awareness of oral health problems, with improvements in oral health-related quality of life (OHRQoL), suggesting less impact of oral health problems relative to other concerns.[23]

Parental anxiety and demand for services

Behavioural and demand-related influences on access were also explored by other studies which examined parental anxiety and attitudes to care seeking. Parents were aware of and concerned about risks of treatment-related transmission of COVID-19.[46 47 49 52] Some studies found that fewer dental visits occurred as a result of these concerns, with half of the mothers participating in a Turkish study reporting that they were 'anxious or fearful about their children visiting dentists during the pandemic' and 64% of the children missing routine dental visits.[52] A German study of dental practices found that around 23% of appointments were cancelled by patients or parents.[55] Chinese parents in Wuhan during the initial stages of the pandemic reportedly preferred to solve issues remotely or independently rather than visit the dentist directly,[53] contributing to fewer dental visits in Wuhan relative to the remainder of China in a national survey, despite 11.7% self-reporting oral disease and higher rates of prepandemic dental visits.[53] This finding was supported by another study in Beijing, China, which found dental emergency department (ED) visits were negatively correlated with the number of newly confirmed COVID-19 cases in the city.[44]

Some studies found parental anxiety intersected with dental anxiety among children; in Poland, dental anxiety was largely unchanged, although caregivers reported higher levels in boys following the pandemic, and parental/caregiver anxiety strongly correlated with children's dental anxiety.[32] An Indian study investigated the impact of dental pain caused by untreated dental decay, as well as parental distress and COVID-19 fear, on the OHRQOL of preschool children during a national lockdown. Higher levels of self-reported pain and dental caries and greater parental fear of SARS-CoV-2 and lockdown-related distress were negatively associated with children's OHRQOL.[27]

Inequity and vulnerability

As with many effects of the COVID-19 pandemic, some of the most challenging impacts on dental services for children have been exacerbated for the most vulnerable, especially those from socioeconomically deprived or ethnic backgrounds, or those with special needs[18 46 65] who experience higher levels of dental disease and disadvantage in accessing dental care.[24 35] Early childhood caries is prevalent in many low and middle-income countries[27] and is a notable measure of health inequality amid concerns regarding oral health as a determinant of paediatric well-being. They are, however, not limited to low- and middle-income countries. For example, a US study reported that those with pandemic-related job loss or decreased household income had a 77% increased risk of unmet child dental care needs.[65] Similarly, cost has been reported to be a barrier to dental service access in Saudi Arabia.[66]

A US modelling study found the excess incidence of first permanent molar dental caries as a result of reduced dental access during COVID-19 was greater for Hispanic and non-Hispanic black children than for non-Hispanic white children, although the 'negative impact on the oral health of children from low-income households and increased disparities could be partially mitigated with increased sealant delivery'.[70] Another US study also found that, while COVID-19 led to a decline in dental visits across all ethnic groups, it did not create new disparities, with existing disparities in access for black and Asian children persisting. Hispanic children had experienced larger increases in adverse oral health outcomes compared with white children, supporting the results of the modelling study.[62]

Restricted access to secondary dental care in English hospital settings particularly affected children, especially the most deprived quintile, with a 94% decrease in hospital episodes of dental caries-related tooth extraction in April 2020 compared with April 2019. As hospital admissions for tooth extraction are strongly socioeconomically patterned, reductions in hospital tooth extractions impacted more on deprived children in absolute terms.[72] A second modelling study from the USA, not specific to children, found similar indirect effects via changes in employment status and loss of insurance coverage could lead to changes in dental utilisation patterns, decreasing routine check-ups while increasing rates of tooth extraction as a procedure that is highly used by uninsured patients and families.[73] Similarly, a cross-sectional study (n=960, 69% rural) in Saudi Arabia[59] found that 72.1% of parents reported that their children had one or more untreated incidents of dental decay. Children with parents who were uneducated, unemployed and low/middle income parents were also reported to be respectively 1.6 times, 2.1 times and 3.1 times more likely to have dental decay, respectively.

Reductions in dental treatments requiring conscious sedation and anaesthesia also primarily affected children and individuals with high levels of dental anxiety, who require specific anxiety management measures.[74] A comparative study assessing the need for emergency dental treatment (at dental screening) among hearing-impaired children (HIC) and non-hearing impaired children (NHIC) found that 43% of HIC required emergency dental treatment versus 14% of NHIC, and 89.1% needed dental treatment compared with 44% of NHIC. Existing challenges were compounded through requirements such as mask-wearing over both mouth and nose.[24]

New models of care

Teledentistry was commonly described as an enabler of access for patients including children, with notable increases in telehealth services observed across a number of studies.[25 49 54 57 68] This shift to teledentistry not only covers outpatient services but also those done in the ED.[20] This was seen as one of a suite of alternate strategies to maintain dental access and reduce oral health burden,[49 68] along with a 'need to reorient dental services to increase prevention'[18] by promoting oral hygiene and other at-home practices[22] and a shift towards 'dental care

restraint', reshaping services towards more conservative approaches to reduce transmission and infection risk.[34] A Turkish study evaluating parental knowledge, attitudes and practices regarding self-medication for dental problems found that 70% of surveyed parents self-medicated their children, usually with previously prescribed medications and in 87% of cases because they had difficulty obtaining a dental consultation. Analgesics were most common, usually for toothache.[56] Whereas in the UK, an ED dental telephone triage service where patients are requested to complete pro forma templates, COVID-19 questionnaires and send pictures for triage was reported to be able to manage 61% of cases over the telephone.[20]

Beyond remote and self-medication, COVID-19 has also stimulated new models of care to enhance access and reduce backlog of dental services arising from the COVID-19 shutdown. One such model is the Greater Manchester Child Friendly Dental Practice Scheme piloted during COVID-19, which aims to reduce unnecessary referrals to specialist paediatric dental services through supplementary training and funding at the primary care level as well as a centralised referral system.[69] The 9-month pilot study in three practices found that, compared with routine care (direct referral to specialist dentists rather than primary care dentists), the average waiting time for an appointment was reduced by about 6 months from referral (209 days vs 23 days). Almost all (99.6%) patients allocated to this new model had an initial appointment within 8 weeks of referral compared with 3.7% for routine care.[69] The study also found that less than 30% of patients had needed onward referral to specialist paediatric dental services from the primary care dentists.

DISCUSSION

Internationally, the COVID-19 pandemic had a marked impact on the provision and utilisation of oral healthcare for children, generating restrictions on both 'supply-side' and 'demand-side' elements of service access.[17] Supply-side constraints have included reductions in the availability of services, marked changes in service profiles and forced delays in accessing routine or preventive dental care. Demand-side effects have been demonstrated in alterations to the care-seeking behaviour of patients and parents and changes in oral health behaviours ultimately impacting on the oral health needs of populations. Like many other health impacts during the pandemic, these effects have been most pronounced among those who are already subject to social or economic disadvantage, despite some authors suggesting that child oral health was not well acknowledged as a consequence of the COVID-19 pandemic[74] and that oral health inequities were not sufficiently prominent in discussions of COVID-19-related exacerbation of inequities more generally.[72] Even so, COVID-19 has shown the benefits of new and existing models of care such as teledentistry, tiered dental services or school-based preventative dental care which may reduce these inequity gaps, though there's a paucity of existing evidence on this.

While this study focused on a relatively narrow conceptualisation of access to dental care as outlined above, we also found a broad body of literature emerging since the commencement of the COVID-19 pandemic,[75] exploring the impact of the pandemic on the clinical practice of dentistry and on dental professionals. Service availability, access and quality, as well as patient experiences of care, are likely to also be influenced by the changes demanded to dental practice, including adaptations and innovations required to reduce risk, ensure safe dental care and minimise transmission of SARS-CoV-2.[8 76] Broader effects on the dental profession include economic concerns and business viability,[77] as well as ongoing educational preparation of dental professionals,[78] workforce availability and safety[79 80] and provider experiences of care provision.[81] In turn, each of these factors may have indirect but substantial effects on the maintenance and accessibility of oral health services.

These findings are strongly consistent with a prior scoping review[82] of the impact of COVID-19 on individual oral health which was last updated in November 2021, prior to the declared end of the pandemic. This review identified an increase in the provision and utilisation of emergency oral health services and a decline in routine dental services, with particular difficulties in access experienced during lockdown periods. Similar themes were identified in both reviews, including emergency care, preventive and routine services, home maintenance of oral hygiene, exploration of dietary habits and other risk factors, alternative models of dental provision and online help-seeking and attitudes towards future oral healthcare.

We found an additional, strongly emergent theme around behavioural and psychological drivers of treatment delays or avoidance, especially among parents, but also focusing on children. Dental anxiety and its relationship to care-seeking behaviour during the pandemic have also been examined by a number of studies in adult populations, finding COVID-19 impacted on willingness to attend appointments for some people[83] and interactions between existing psychosocial factors and OHRQOL.[84] The slower return to prepandemic levels, especially for preventive and prophylactic dental services, is concerning, as they are in practice, and is most important to restore the postpandemic period to prevent future unnecessary dental treatments.

Overall, our results on this issue were mixed, and future research may more effectively illuminate the psychology behind delayed treatment during this period. For example, to what extent are parents influenced by genuine concern regarding the risk of contracting COVID-19 in a healthcare setting, uncertainty about what services are open and when, or whether pandemic conditions may be used as a pretext for delaying treatment related to other reasons, such as financial, time or psychological constraints.

Some authors have speculated about a potential negative impact of lockdowns and home schooling on oral health

and dental disease. Anecdotal reports have proposed that many children, especially those from lower-income families, may have been largely unsupervised at this time, resulting in significant increases in the consumption of high-sugar junk foods and a subsequent increase in caries and general dental decline.[85] This issue was not apparent in our review, although we found mixed evidence for differences in dental hygiene and oral health behaviours across socioeconomic status.

As has been the case in healthcare more broadly, the use of virtual care via teledentistry was a strongly emergent theme in the oral health literature during the COVID-19 pandemic, and several studies described its use with children.[9 68] However, others have cautioned that the drive towards digital dentistry platforms should be subject to feasibility and quality assessments, especially among vulnerable groups such as children.[86] In practice, teledentistry has had mixed uptake during this period, with dentists sometimes unsure how to bill for services, and many patients or parents not considering it a viable option for dental consults.

COVID-19 has, however, provided evidence of the benefit of school-based preventive dental care models[31] with significantly lower rates of dental conditions when they were in place as compared with the period post the shutdown of this programme due to the COVID-19 pandemic. It had also provided the necessary impetus to trial new models of care to support reducing the backlog, especially on specialist paediatric dentists through a tiered approach with primary care dental services being optimised.[69]

Strengths and limitations

Strengths of this review include the pragmatic grounded foundation for the study and the iterative delineation of the review question in consultation with policy makers as end users of the review findings. The study is limited by the speed with which it needed to be conducted in order to align with decision-making timelines, by restricting searches to only two databases and by the use of a single reviewer to undertake screening, data extraction and analysis due to capacity constraints. However, the review employed standardised review methodologies in order to maintain rigour and minimise the effect of these limitations and is reported in accordance with PRISMA guidelines.[13]

CONCLUSION

The COVID-19 pandemic has had pronounced negative effects on the provision of primary and secondary dental care for children around the world. Access to dental care had been reduced as a result of alterations in service availability and decreased utilisation linked to patient-driven and parent-driven demand. There have been changes to the configuration of services provided, particularly greater rates of emergency treatment, reduction in aerosol-generating procedures and more use of teledentistry, self-management and prevention approaches. Delays in obtaining routine dental care have become common, leading to more dental problems and ongoing need, especially untreated dental caries among children. These shifts have had a disproportionate impact on socioeconomically disadvantaged and vulnerable children and families, further entrenching established inequalities. New models of care that emerged during the dental pandemic suggest the potential to improve access, but there remains a need to ensure they close existing inequalities rather than maintain the status quo. Refocussing oral health programmes, both publicly and privately delivered, to address known and emerging barriers to accessing dental care should be considered a priority in the pandemic period.

RESEARCH IN CONTEXT

Evidence before this study

Oral health is an important element of overall health and well-being, a key component of comprehensive primary healthcare and a public health priority. Yet poor oral health is a neglected health issue affecting up to half the world's population, with a substantial impact on quality of life and disproportionate impact among disadvantaged members of the community. The COVID-19 pandemic disrupted services for many chronic and preventable conditions, including oral health and dental disease.

Added value of this study

This scoping review synthesises international evidence examining the impact of COVID-19 on access to dental services among children and potential future models of care. This has been used to inform policy decision-making around subsidised dental services for children from low-income families.

Implications of the evidence

The COVID-19 pandemic has had pronounced negative effects on the provision of primary and secondary dental care for children around the world, especially those who are vulnerable or socioeconomically disadvantaged. Access to care was affected by both disruptions to service availability and supply, and by changes in demand for services related to parental anxiety around the risk of COVID-19 transmission. Delays in receipt of routine dental care and changes to oral health behaviours are likely to lead to increase need for future oral health services.

Author affiliations
[1]College of Health & Medicine, Australian National University, Canberra, Australian Capital Territory, Australia
[2]Respiratory and Health Systems Division, The George Institute for Global Health, Sydney, New South Wales, Australia
[3]School of Population Health and International Center for Future Health Systems, University of New South Wales, Sydney, New South Wales, Australia
[4]Australian Government Department of Health and Aged Care, Canberra, Australian Capital Territory, Australia
[5]International Centre for Future Health Systems, University of New South Wales, Sydney, New South Wales, Australia
[6]University of Oxford Nuffield Department of Primary Care Health Sciences, Oxford, UK

X Anthony Paulo Sunjaya @SunjayaMD

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Contributors SHD conceptualised and designed the study, collected, curated and analysed data and drafted and finalised the manuscript. APS collected, curated and analysed data, contributed to data interpretation, writing and editing. DJ reviewed initial analysis and contributed to data interpretation, writing and editing. MK conceptualised and designed the study, reviewed initial analysis and interpreted data and contributed to writing and editing the manuscript. MK is the guarantor.

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Competing interests SHD is employed by the Australian National University and seconded to the Australian Government Department of Health and Ageing undertaking action research in relation to COVID-19 and primary care. APS is supported by the Australian Government Medical Research Future Fund and the Tyree Foundation. He holds appointments at The George Institute for Global Health and UNSW Sydney. DJ is a dentist in private practice and also employed by the Australian Government Department of Health and Aged Care as a dental adviser. MK was a salaried officer of the Australian Government Department of Health and Aged Care; he now holds academic appointments with the University of Oxford and the University of New South Wales. He is a Director of Therapeutic Guidelines Ltd.

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ORCID iDs
Sally Hall Dykgraaf http://orcid.org/0000-0002-8532-1086
Anthony Paulo Sunjaya http://orcid.org/0000-0003-2257-4374

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